The production of rubber and rubber products is a large and diverse industry. The rubber product manufacturing industry is basically divided into two major sectors: tyre and non-tyre. The tyre sector produces all types of automotive and nonautomotive tyres whereas the non-tyre sector produces high technology and sophisticated products like conveyor belts, rubber seals etc. The wide range of rubber products manufactured by the rubber industry comprises all types of heavy duty earth moving tyres, auto tyres, tubes, automobile parts, footwear, beltings etc.

The rubber industry has been growing tremendously over the years. The future of the rubber industry is tied to the global economy. Rapidly growing automotive sector in developing economies and increased demand for high-performance tyres are expected to contribute to the growth of the global industrial rubber market. The current scenario reveals that there is a tremendous scope for the development of rubber processing industries. The global market for industrial rubber products is projected to increase 5.8 % per year. Investment in rubber industry is expected to offer significant opportunities in the near future and realizing returns to investors willing to explore this sector.

This book deals with all aspects of rubber processing; mixing, milling, extrusion and molding, reclaiming and manufacturing process of rubber products. The major contents of the book are rubbers materials and processing, mixing technology of rubber, techniques of vulcanization, rubber vulcanization, rubber compounding, rubber reclaiming, manufacture of rubber products, latex and foam rubber, silicone rubber, polybutadiene and polyisoprene, styrene butadiene rubber, rubber natural etc. The book contains addresses of plant & machinery suppliers with their Photographs.

It will be a standard reference book for professionals, entrepreneurs, those studying and researching in this important area and others interested in the field of rubber processing technology.
Contents

1 RUBBERS: MATERIALS AND PROCESSING TECHNOLOGY
   Natural Rubber Plantation
   Tapping of Rubber Latex
   Preservation and Coagulation of Latex
   Chemical Nature of Natural Rubber Hydrocarbon
   Hydrogenated Rubber
   Cyclized Rubber
   Chlorinated Rubber
   Rubbers from Stereo-regular Polymerization of Isoprene and Butadiene
   Styrene-Butadiene Rubber (SBR)
   Polychloroprene Rubber (CR)
   Nitrile Rubber (NBR)
   Butyl Rubber (IIR)
   Ethylene-Propylene-Diene Terpolymer (EPDM)
   Polysulphide Rubber (PSR)
   Polycrystalline Rubber (PCR)
   Polyacrylic Rubber or Acrylate Rubber (ACR)
   Fluorocarbon Rubber (FKM)
   Introduction
   Mastication and Mixing
   Open Mill
   Internal Mixers
   Reclaimed Rubber
   Fillers
   Antidegradants
   Accelerators
   Retarders
   Activators
   Tyres
   Belting and Hoses
   Cellular Rubber Products
   Miscellaneous Applications of Rubber
   Passenger Tyre
   Tube Compound for Car tyres
   Conveyor Belts
   Insulation Compound for Cables
   Shoe Soles
2 MIXING TECHNOLOGY OF RUBBER
   Two-roll Mills
   Internal Batch Mixers
   Continuous Mixers
   Advantages of continuous mixing
   Disadvantages of continuous mixing
   Development of the Banbury Mixer
   Operating Variables
   Ram Pressure
   Rotor Speed
   Batch Size
   Coolant Temperature
   Unit Operations in Mixing
   Single-Pass Versus Multiple-Pass Mixing
Types of Mix Cycle
Late Oil Addition
Upside-down Mixing
Sandwich Mixes
Analysis of Changes to the Mix Procedure
Acceleration of First-pass Compound
Mill Mixing of Speciality Compounds
Acceleration in Line with Internal Mixing
Testing of Raw Materials
Elastomers as Raw Materials
Fillers
Plasticisers and Process Oils
Small Ingredients
Control of Composition
Tracking the Mix Cycle
Compound Testing
Basic SPC Charting
Rheometer Data and its Meaning
Mixing Control Software
Peptisers in Natural Rubber
Effects of Temperature
Effects of Time
Effects of Use Level
Effects of Other Additives
Peptisers in SBR
Peptisers in Sulphur-containing Polymers
Additives to Increase Viscosity
Preventing Unwanted Chemical Reactions
Filler Treatments
Bin Storage Problems
Inspection of Banbury Mixers
Inspection at the Mezzanine Level
Side Cooling
Rotor Cooling
Rotors and Bearings
Rotor Bearing Lubrication
Dust Stops
Drop Door and Latch
Hydraulic System
Grease System
Dust Stop Lubrication
Drive Gears
Couplings
Inspection of the Banbury Platform
Ram and Cylinder
Heating Weight
Piston Rod
Weight Pin Assembly
Hopper Door
Air Line Filter
Hopper Operation
Mixer Maintenance and Lubrication
Each time the mixer is started
Once per shift
Once per day
Once per week
Once per month
Every six months
Anticipating Required Service
Dust Stop Maintenance
SSA Dust Stops
Assembly
Lapping
Running
Banbury Mixer “Hydraulic Dust Stops
Assembly
Run-in
Lapping
Production
Flushing
EPDM Expansion Joint Cover
Expansion Joint Intermediate Layer
Traffic Counter Treadle Cover
SBR/IR Belt Cover
EPDM Low Voltage Electrical Connector
Peroxide-cured Black-filled EPDM Compounds
EPDM Concrete Pipe Gasket
Injection-moulded NBR Gasket
CR/SBR Blend
Low Durometer CR/SBR Blend
Non-black CR for Injection Moulding
Hard Rubber Industrial Wheel
High Durometer NBR Masterbatch
NBR/PVC Cable Jacket
NBR/PVC/SBR Blend
Butyl Masterbatch
Butyl Masterbatch, Heat Interacted
Chlorobutyl/NR Blend
CSM CORD Jacket
Non-black Millable Urethane
Some Major Changes
Tempered Water
Power-controlled Mixing
Energy Conservation
Composition of EPDM Elastomers
Variables in EPM and EPDM Elastomers
Average Molecular Weight
Molecular Weight Distribution
Ethylene/Propylene Ratio
Type of Diene
Diene Level
How Processing Relates to Structure and Rheology
Practical Guidelines for Mixing EP Elastomers
Using Internal Mixers
Polymer Composition and Form
Filler/Oil Levels and Types
Electron Beam Vulcanization
Nitroso Compounds
Metal Oxides
5 RUBBER COMPOUNDING
General Compounding Principles
Tensile Strength
Tear Resistance
The Crescent Tear Test
The Hardness of Rubber
Set
Abrasion Resistance
Flex Cracking Resistance
Resilience
Heat Build-up
Temperature Resistance
Tyres
Retreading Materials
Conveyor Belting, Transmission Belting and Hose
Footwear
Rubber Roller
Medical Applications
‘O’ rings and Seals
Rubber Blends
Master Batches
Choice of Rubber
Fillers
Vulcanizing Agents
Peptizers
Accelerators
Activators
Anti-oxidants
Retarders
Softeners and Plasticizers
Rubber Crumb
Factice
Processing Aids
Special Purpose Additives
Unvulcanized compound properties
Vulcanized compound properties
6 RUBBER RECLAIMING
7 MANUFACTURE OF RUBBER PRODUCTS
Classification
Components
Tyre Building
Parts of a Conveyor Belt
Cover rubber
Manufacturing Process
Finished belt testing
PVC Belting
Steel Cord Belting
Design of Hoses
Hose Manufacture
Braided/spiralled hoses
Testing of Hose Constructions

V-Belt Manufacture

Main Types of Power Transmission Belts

Preparation of Ingredients

Stability of Latex Compounds

Manufacture of Latex Products

Foaming and Gelling

Vulcanization

Classification and Terminology

Fabric Lined Water-proof Shoes

Canvas Shoes

Micro-cellular Soling

Manufacturing procedure

Types of Mountings

8 LATEX AND FOAM RUBBER

Selection of Raw Materials

Preparation of Raw Materials

Compounding and Design

Maturation

Processing and shaping

Dipped Goods

Latex Thread

Vulcanisation

Hot Air Cure

Hot Water Vulcanisation

Autoclave Vulcanisation

Radiation Vulcanisation

Ultrasonic Wave Curing

Testing of Rubber Products

Packing and Marketing

Conclusions and Recommendations

Manufacture of Latex Foam

Dunlop Process

Mechanism of Gelling

Compounding

Foaming and Gelling

Construction of Moulds

Curing

Washing

Drying

Finishing

Common Defects in Foam Making

Shrinkage

Foam Collapse

Setting

Complete Distortion of the Foam

Protein estimation protocol

Conclusion

9 SILICONE RUBBER

Electronics and Electrical Industries

Silicone Rubbers to Mimic Flesh
Silicone Polymers
Silicone Rubber Elastomers
Reinforcing Fillers
Semireinforcing or Extending Fillers
Additives
Curing Agents
Mixing
Freshening
Moulding
Extrusion
Calendering
Dispersion Coating of Fabric
Heavy-duty Hose
Bonding
Bonding Unvulcanised Silicone Rubber
Bonding Vulcanised Silicone Rubber
Post-baking
Condensation Cure—One-component
Condensation Cure—Two-component
Addition Cure
10 POLYBUTADIENE AND POLYISOPRENE
Polyisoprene
Cyclopolyisoprene
Gel and Branching
Polybutadiene
Isoprene
Butadiene
11 STYRENE BUTADIENE RUBBER (SBR)
Raw Materials
Production of Hydrocarbon Rubber
Manufacture of Emulsion SBR
Vinyl Content and Blockiness
Molecular Weight and Branching
Manufacture of Solution SBR
Property Control
Branching
Blending
Properties
Tg Measurement
Molecular-weight Measurement
Dynamic Mechanical Measurements
Applications of SBR
12 RECLAIMED RUBBER
Whole Tyre Reclaim
Drab and Coloured Reclaims
Butyl Reclaim
Scrap-rubber Preparation
Reclaimed Rubber
Digester Process
Reclamator Process
Pan Process
Engelke Process
NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.


NPCS also publishes varies process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.